

**REMARKS**

The office action issued by the Examiner and the citations referred to in the office action have been carefully considered.

Claim 20 has been rejected as indefinite and thus has been cancelled.

**Claim Rejections under 35 U.S.C. 103(a)**

Claims 1-4, 6, 9, 18, 21, 22, 24, 27 and 36 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi (U.S. Patent Publication No. 2003/0024813) (hereinafter "Taniguchi '813") in view of Nakamura et al (USP 4,024,036).

The examiner argues that, with respect to claims 1 and 2, Taniguchi '813 discloses a hydrogen sensor comprising first and second electrodes 31 and 32 and an electrolyte 11 where the first and second electrodes are made of different materials (par. 0077 and 0078) and that these different materials would inherently have different chemical potentials or absorption-dissociation properties towards hydrogen gas. In particular, he says, Taniguchi '813 discloses that one of the electrodes can be an A1 or an A1 alloy while the other electrode can be a material like Pt or Pd (par. 0077). These choice of materials of Taniguchi '813 overlap the claimed materials of claims 4 and 22. The hydrogen gas detection of Taniguchi '813 is based on an electromotive force (fig. 7B and par. 0078). Taniguchi '813 does not explicitly disclose the use of a phosphorus tungsten or molybdenum acid. However, Nakamura, he argues, discloses that both phosphorus tungsten and molybdenum acids are known proton electrolytes for hydrogen sensors. See abstract; col. 1, ll. 7-12; and col. 4, l. 54 - col. 5, l. 1. It would have been obvious, he concludes, to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Nakamura for the electrolyte of Taniguchi '813 because the substitution of one known proton selective electrolyte for another requires only routine skill in the art.

With respect to claims 3 and 21, because the materials of Taniguchi '813 overlap those the present invention (compare par. 0077 with claims 4 and 22), the examiner argues that the electrodes of Taniguchi '813 would inherently have these properties.

With respect to claims 4 and 22, he refers to par. 0077 and the discussion of claims 1 and 2 above.

With respect to claims 6 and 44, Nakamura, he says, also teaches that the two electrodes of a gas sensor can be on opposite sides of an electrolyte (fig. 5).

With respect to claims 9 and 27, he refers to par. 0051 of Taniguchi '813 and col. 12, ll. 3-27 of Nakamura.

With respect to claims 18 and 36, he refers to fig. 8 and par. 0078 and 0080 of Taniguchi '813. As to par. 0080 the examiner states that fig. 8. shows the current flowing; fig. 8 thus clearly shows that the signal is an electromotive force (i.e. voltage) and not a current as in fig. 6. See also par. 0078 where Taniguchi '813 clearly stated that the measured signal for the embodiment 3 of fig. 7B and 8 is an electromotive force sensor. Hence, Taniguchi '813's discussion of current in par. 0080 would appear to be a misprint (according to the examiner).

Claims 7 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi '813 in view of Nakamura as applied to claims 1 and 2 above, and further in view of Makundan et al (US 6,656,336).

With respect to the claims, the examiner argues that Taniguchi '813 and Nakamura disclose all the limitations of the claims, but Taniguchi '813 does not appear to expressly disclose that the electrodes may be arranged as rods on a substrate with an electrolyte disposed in between. However, Makundan, he says, discloses Figure 1B, a hydrocarbon sensor in which two electrodes 12 and 16 are disposed on an electrolyte 10. Electrode 16 is obviously in the shape of a rod. He thus concludes that, at time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the electrodes of Taniguchi '813 to be rods as those of Makundan because the positioning of the electrodes yields no significant functional difference and are therefore are a matter of obvious engineering choice. Although only one electrode in Makundan is actually shaped like a rod, one of ordinary skill in the art would not have difficulty discerning that the other electrode could be fashioned in the similar manner.

Claims 8 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi '813 in view of Nakamura as applied to claims 1 and 2 above, and further in view of Sugiyama et al (US 4,704,536). The examiner argues that, with respect to the claims, Taniguchi '813 and Nakamura disclose all the limitations of the claims, but does not appear to expressly disclose that the electrodes may be arranged as concentric cylinders. However, Sugiyama discloses figure 9, a gas sensor with two co-axial electrodes 23 and 24 configured as concentric cylinders. At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the gas sensor configuration of Taniguchi '813 with the concentric, cylindrical electrodes in Sugiyama because the positioning of the electrodes yields no significant functional difference, and therefore concentric cylindrical electrodes are a matter of an obvious engineering choice.

Claims 10 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi '813 in view of Nakamura as applied to claims 2 and 9 above, and in further view of Yun et al (WO 01/89021) (hereafter "WO '021"). The examiner argues that, with respect to the claims, Taniguchi '813 and Nakamura disclose all the limitations of claim 9. Taniguchi '109 does not appear to expressly disclose the electrolyte comprise an internal scaffold of a material such as glass wool. However, WO '021 discloses in the abstract an electrolyte in which contains an electrospun matrix of polymeric, electrolytic material into which lithium salt-dissolved organic electrolytes are incorporated. One of the advantages of this construction as outlined by WO '021 is a "good mechanical strength." At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the electrolyte of Taniguchi '813 and Nakamura with an internal matrix like WO '021 because one would wish to take advantage of the improved mechanical strength such a construction would offer.

Claims 11-16 and 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taniguchi '813 in view of Nakamura as applied to claims 1 and 2 above, and further in view of Christen et al (USP 4,390,869). With regard to claims 11-13 and 29-31, he says that Taniguchi '813 and Nakamura teach a hydrocarbon sensor with all the limitations of claims 1 and 2. The preambles for each claim (e.g. "a hydrogen gas leak controlling system" or "a hydrogen gas leak information transmitting system," etc.) are not structurally limiting and have not been given

patentable weight. Taniguchi '813 does not expressly teach that a voltage comparator be used in the apparatus. However, Christen teaches a gas sensing signaling system. In particular, Christen teaches figure 7 which includes three comparators 101/1, 101/2, 101/3. These are voltage comparators (col. 12, lines 21-33). At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to include a voltage comparator like that from Christen in the apparatus of Taniguchi '813 because of the necessary advantages of doing so, such as eliminating false alarms or alarms for negligible concentrations of gas.

With respect to claims 14-16 and 32-34 and those limitations not covered above, the examiner argues that Christen teaches the use of Schmitt triggers to distinguish between warning signals and alarm signals (col. 15, lines 32-43).

Claims 17 and 35 are rejected under 35 U.S.C 103(a) as being unpatentable over Taniguchi '813 in view of Nakamura as applied to claims 1 and 2 above in view of Maki et al (US 2004/0026268). The examiner points out that Taniguchi '813 and Nakamura teach all the limitations of the claims, but does not expressly teach that there be a plurality of hydrogen gas sensors arranged on the same substrate. However, Maki teaches an apparatus which is an electromotive force type gas sensor comprising a substrate and a gas sensor on that substrate (Maki, claim 1). Further, Maki teaches a claim 8 drawn to an electromotive force gas sensor with two or more electromotive force gas sensors on the same substrate. At the time of the invention, it would have been *prima facie* obvious to those of ordinary skill in the art to provide a plurality of gas sensors like in Taniguchi '813 on the same substrate like in Maki because of the versatility such a configuration would have, such as the ability to allow for failure of some gas sensors without failure of the whole apparatus as well as the ability to possibly discern a target gas profile or concentration gradient.

Claims 40 and 41 are allowed. The allowance of these claims is appreciated.

Considering first the rejection of claims 1-4, 6, 9, 21, 22, 24, 27 and 36 under 35USC 103(a) as being unpatentable over Taniguchi (US 2003/0024813) (hereinafter "Taniguchi '813") in view of Nakamura et al. (USP4,024,036), the Examiner argues that Taniguchi '813 teaches a

hydrocarbon sensor comprising a first and a second electrodes 31 and 32 and an electrolyte 11 where the first and second electrodes are made of different materials (paragraphs [0077] and [0078]) and that these different materials would inherently have different chemical potentials or absorption-dissociation properties towards hydrogen gas.

Then, the Examiner insists that Taniguchi '813 does not teach the use of a phosphorous tungsten or molybdenum acids, but Nakamura teaches that both phosphorous tungsten or molybdenum acids are known proton electrolytes for hydrogen sensors (see, abstract; col. 1, l. 7-12 and col. 4, l. 54-col. 5, l. 1).

The claims have been amended to clearly indicate that the solid electrolyte is made of at least one of the phosphorous tungsten acid and the phosphorous molybdenum acid and contains a reinforcing material therein (see paragraph [0037] of the specification). As for the solid electrolyte made up of the phosphorous tungsten acid and the phosphorous molybdenum acid containing the reinforcing material, the adhesion between the solid electrolyte and the first electrode and the adhesion between the solid electrolyte and the second electrode can be enhanced (see paragraph [0037] of the specification). The combination of the use of at least one of the phosphorous tungsten acid and the phosphorous molybdenum acid and the reinforcing material is not taught by Taniguchi '813 alone or in combination with Nakamura 036, or any other secondary reference cited and applied by the examiner.


### **Conclusion**

If the Examiner believes all these claims are not allowable, he is respectfully requested to call the undersigned to discuss any changes to the claims to render them allowable.

It is respectfully submitted that all of the Examiner's objections have been successfully traversed and that the application is now in order for allowance. Accordingly, reconsideration of the application and allowance thereof is courteously solicited. The Director is authorized to charge any additional fee(s) or any underpayment of fee(s), or to credit any overpayments to **Deposit Account Number 50-2638**. Please ensure that Attorney Docket Number 125141-010100 is referred to when charging any payments or credits for this case.

Respectfully submitted,

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